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MEDOC MOUNTAIN STATE PARK AQUATIC INVENTORY

by
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edited by
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Cooperating Agencies:
Division of Parks and Recreation, NC Natural Heritage Program
NC Wildlife Resources Commission
US Fish and Wildlife Service

Funded by
NC Natural Heritage Trust Fund
NC Nongame and Endangered Wildlife Fund
National Fish and Wildlife Foundation

NORTH CAROLINA WILDLIFE RESOURCES COMMISSION
JULY 1, 1996

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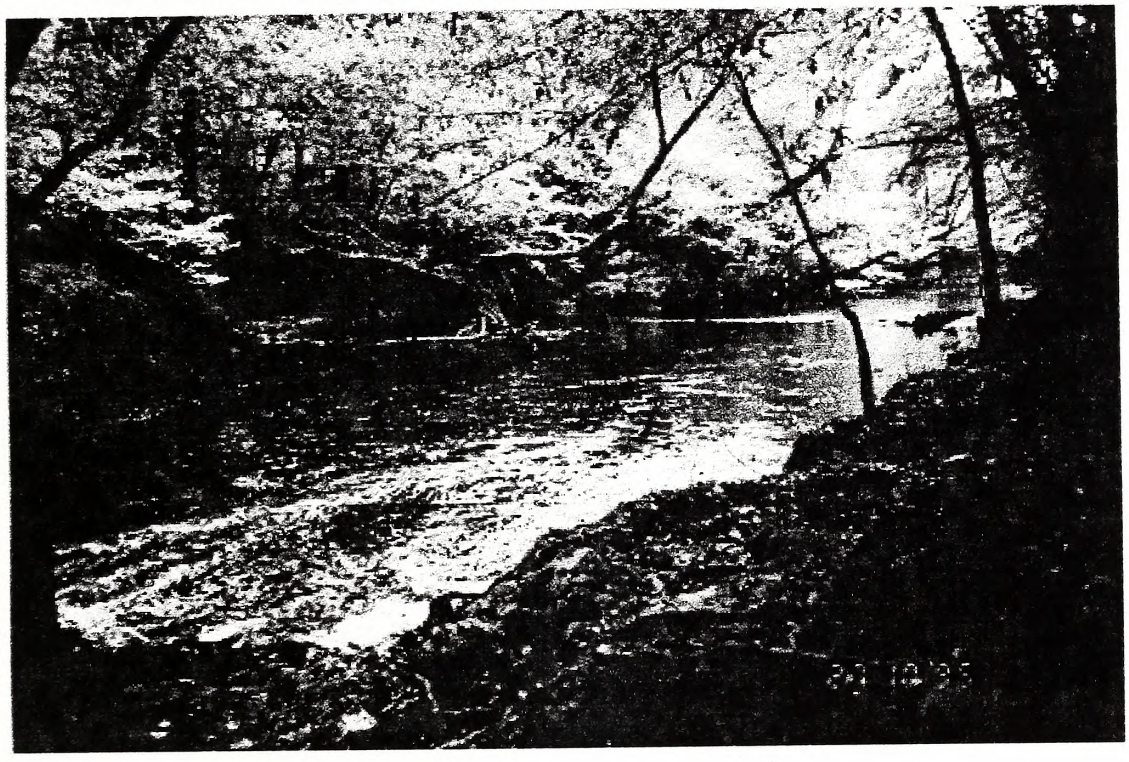
MEDOC MOUNTAIN STATE PARK
AQUATIC INVENTORY



Little Fishing Creek near Discovery Trail

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Medoc Mountain State Park Aquatic Inventory

Introduction

Medoc Mountain State Park is located in Halifax County and encompasses 2,305 acres. The park land is no longer a mountain, but the remains of an ancient range of mountains. The structure is composed of biotite granite with an elevation of 325 feet. The lands were purchased in 1972 by the Division of Parks and Recreation after a five-county survey for a suitable state park site. Before the lands were purchased, they were used for agriculture, mining explorations, hunting, horseback riding, hiking, and camping.

Little Fishing Creek is the main waterway running through Medoc Mountain State Park. It drains into Fishing Creek in the Tar River Basin. The purpose of this project was to survey for aquatic species, including crayfish, fish, snails, mussels, and sphaeriid clams. Our inventory included the main waterway of the park as well as its tributaries in Warren and Halifax counties. Figure 1 details the localities of all stations surveyed, as well as the areas inventoried by canoe. The following sections will provide information on the species in the above taxa which were documented at each site in the Little Fishing Creek Subbasin.

Acknowledgments

The completion of this project would not have been possible without the invaluable assistance of the following people: William F. Adams, J. Eric Alderman, John M. Alderman, Alvin Braswell, Allen Boynton, Mike B. Carraway, John E. Cooper, Mark A. Hartman, Tom Henson, Merrill Lynch, Gerald L. Mackie, Chris McGrath, Lawrence M. Page, William M. Palmer, Tim Savidge, Danny Smith, Kenneth R. Taylor, Fred G. Thompson, and Randall C. Wilson. We also thank all state park staff and landowners who allowed us to work on their properties.

Gabriela B. Mottesi

LITTLE FISHING CREEK SUBBASIN

STATIONS & CANOE RUNS INVENTORIED

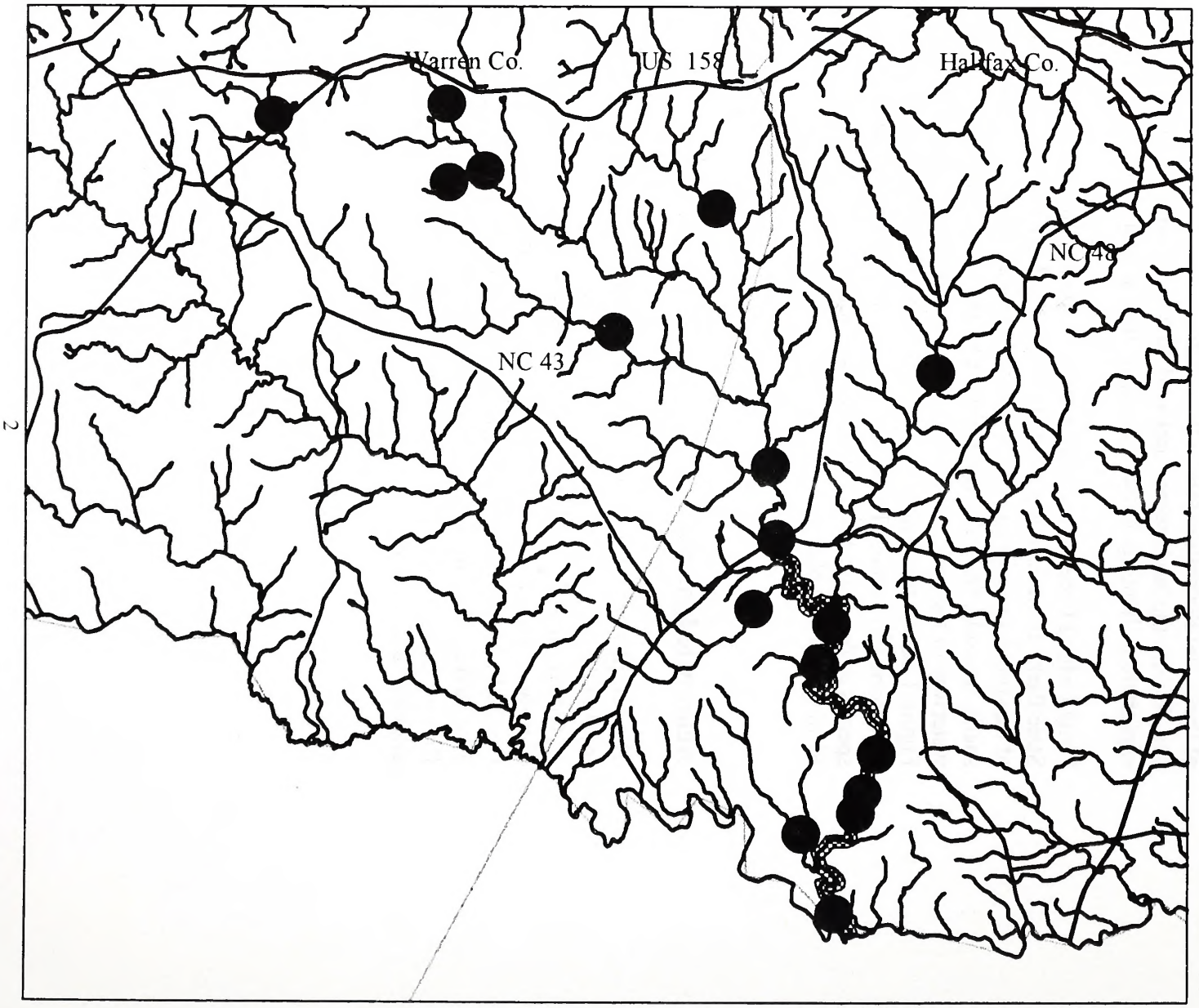

Figure 1.

Aquatic Snails

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Division of Wildlife Management
NC Wildlife Resources Commission

Introduction

There are approximately 500 species of aquatic snails currently recognized in North America. These 500 species are divided into 78 genera and 15 families (Burch 1989). In North Carolina, there are approximately 52 species representing 8 families (Adams 1990).

Snails are grouped into one of two subclasses. Prosobranch snails are gill-breathing and have an operculum, which is a calcareous plate that closes the aperture when the snail withdraws into its shell. Pulmonate snails are lung-breathing and do not have an operculum to seal their aperture (Burch 1989).

These animals graze on algae and other microscopic organisms using radular teeth to grind food to an appropriate size for consumption. Snails are an essential part of aquatic ecosystems, as well as indicators of water quality. However, they are typically overlooked. The lack of information and knowledge of snails can be attributed, in part, to their minute size, perceived lack of activity, cryptic habits, and difficulty in identification.

Methods

Study areas for this project included certain aquatic habitats associated with Little Fishing Creek and its tributaries (Fig. 1, Introduction Section). Most habitats in Little Fishing Creek can be described as riffle/run with medium to fast flows. Pools of different sizes with low flows were also present. Substrates included combinations of silt, sand, gravel, cobble, boulder, and bedrock. Cobble is common in Little Fishing Creek. Some aquatic vegetation and organic debris were also present.

Specimens were collected using visual and tactile searches. Due to the cryptic habits of some snail species, it was necessary to sift and dredge substrates. Snails were collected at bridge crossings and during canoe runs. All available habitats were sampled.

Snails were preserved and stored in 70% ethanol. Snails and limpet snails were identified by using Burch (1989) and Basch (1963). Verifications of a

subset of specimen identifications were made by Dr. Fred G. Thompson. Expected distributions and the following characteristics were used to identify the specimens: presence/absence of an operculum, direction of coiling, shell size and shape, texture of the shell, and shape and number of the whorls. With additional information, the identifications may be subject to change.

Results and Discussion

Snails were located at 19 of the sites surveyed (Fig. 1). Fourteen species representing seven families and both subclasses were found within the Little Fishing Creek Subbasin (Table 1).

Elimia catenaria, *Elimia virginica*, *Leptoxis (Mudalia) carinata*, *Lioplax subcarinata*, and *Pseudosuccinea columella* were found attached to rocks in the faster current.

Campeloma decisum, *Physella* sp., and *Helisoma anceps* were collected in the backwater areas with slower flow in the mud/silt substrate. *Helisoma anceps* was also found in the aquatic vegetation. *Campeloma decisum* is considered a species complex (Adams, pers. comm., 1995). Therefore, when more information is acquired, this species complex may be separated into a few recognizable species.

Menetus dilatatus, *Amnicola* sp., *Gillia altilis*, and *Amnicola (Lyogyrus) granum* were found in the aquatic vegetation and on the underside of rocks in both the slow and faster current. To our knowledge, this is the first record of *Amnicola (Lyogyrus) granum* for North Carolina. Dr. Fred Thompson stated, "the combination of thin shell, its shape, umbilicus, number of whorls, shape and diameter of the embryonic whorls separate the species from anything else in this part of the country" (pers. comm., 1996).

The limpet snails, *Ferrisia rivularis* and *Laevapex fuscus*, were common on the underside of rocks in the slower current.

The Little Fishing Creek Subbasin supports a great abundance and diversity of snails. As is shown in Table 2, most species were found in good numbers at each site. The habitat diversity of this area allows for the prevalence of species preferring slow backwater areas and those which prefer the faster riffle/run areas.

References

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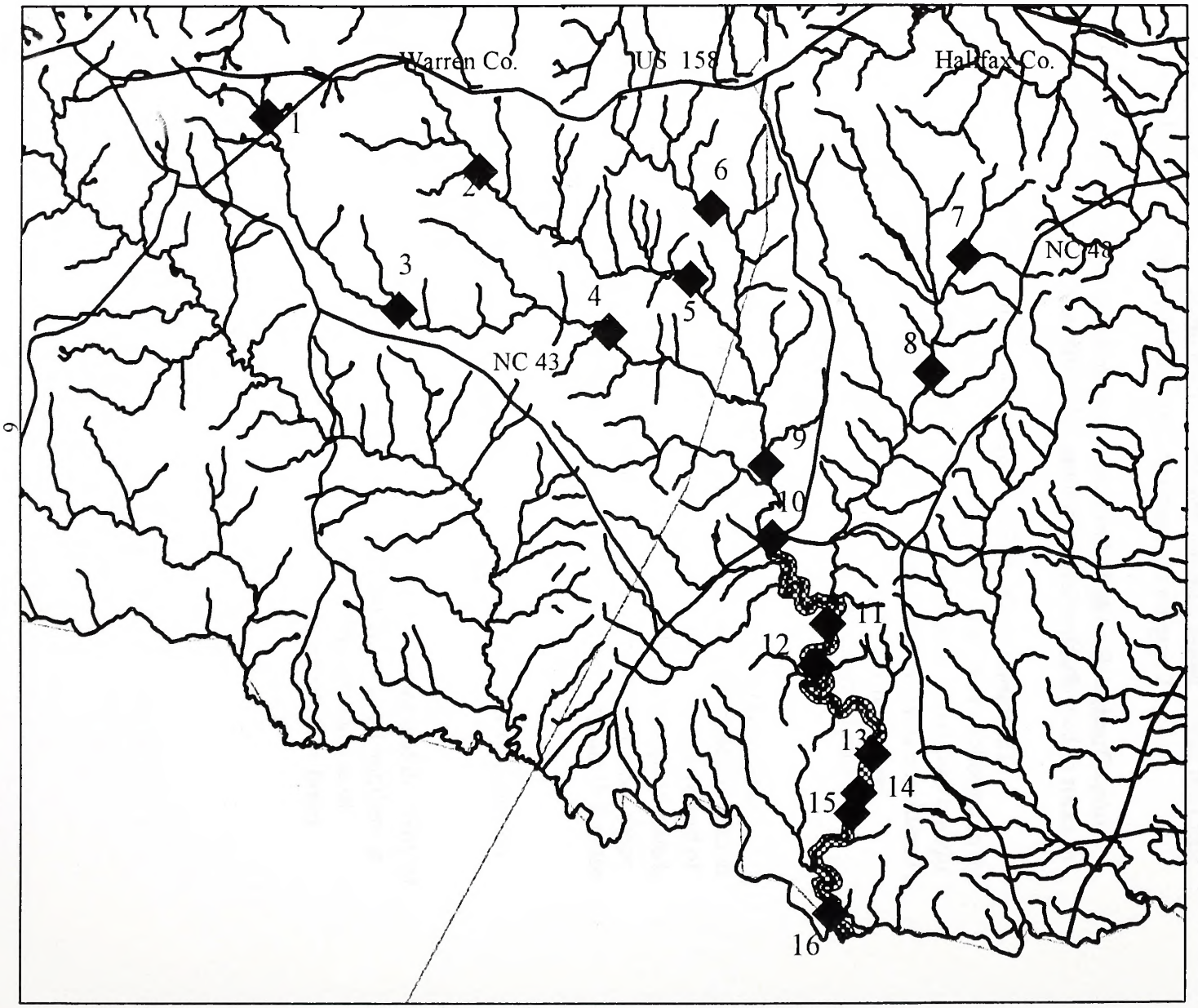
LITTLE FISHING CREEK SUBBASIN

AQUATIC SNAIL SPECIES INVENTORY



Legend

Dot No.	Station No.
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2	950727.3
3	960603.1
4	950815.5
5	960603.2
6	950817.1
7	960603.5
8	951023.1
9	951026.1
10	950823.1
11	960603.4
12	950803.1
13	950802.1
14	950731.1
15	960603.3
16	951025.1

Figure 1.

Miles

0 2 4

Table 1. Snails found in the Little Fishing Creek Subbasin

Prosobranchia	
Hydrobiidae	
Amnicola (Lyogyrus) granum (Say, 1822)	Squat duskysnail
Amnicola sp.	
Gillia altilis (I. Lea, 1841)	Buffalo pebblesnail
Pleuroceridae	
Elimia catenaria (Say, 1822)	Gravel elimia
Elimia virginica (Say, 1817)	Piedmont elimia
Leptoxis (Mudalia) carinata (Bruguière, 1792)	Crested mudalia
Viviparidae	
Campeloma decisum (Say, 1816)	Pointed campeloma
Lioplax subcarinata (Say, 1816)	Ridged lioplax
Pulmonata	
Lymnaeidae	
Pseudosuccinea columella (Say, 1817)	Mimic lymnaea
Physidae	
Physella sp.	
Planorbidae	
Helisoma anceps (Menke, 1830)	Two-ridge rams-horn
Menetus dilatatus (Gould, 1841)	Bugle sprite
Ancylidae	
Ferrissia rivularis (Say, 1817)	Creeping ancylid
Laevapex fuscus (C. B. Adams, 1841)	Dusky ancylid

Table 2. Snails found in the Little Fishing Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
950727.1	*Campeloma decisum*	Pointed campeloma	Reedy Pond Creek	SR 1325	Warren Co., NC	27 July 1995	11	G.B. Mottesi
950727.3	*Campeloma decisum*	Pointed campeloma	Walkers Creek	SR 1507	Warren Co., NC	27 July 1995	20	F.G. Thompson, G.B. Mottesi
950731.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	4	G.B. Mottesi
950731.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	7	G.B. Mottesi
950731.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	1	G.B. Mottesi
950731.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	31	G.B. Mottesi
950731.1	*Lioplax subcarinata*	Ridged lioplax	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	5	G.B. Mottesi
950731.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	8	G.B. Mottesi
950802.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	5	G.B. Mottesi
950802.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	3	G.B. Mottesi
950802.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	12	G.B. Mottesi
950803.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	32	G.B. Mottesi
950803.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	20	G.B. Mottesi
950803.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	18	G.B. Mottesi
950803.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	2	G.B. Mottesi
950803.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	23	G.B. Mottesi
950803.1	*Physella sp.*	---	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950815.3	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	NC 561	Halifax Co., NC	15 August 1995	3	G.B. Mottesi
950815.4	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1315	Halifax Co., NC	15 August 1995	8	G.B. Mottesi
950815.4	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1315	Halifax Co., NC	15 August 1995	2	G.B. Mottesi
950815.5	*Campeloma decisum*	Pointed campeloma	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950816.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	22	G.B. Mottesi
950816.1	*Physella sp.*	---	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	1	G.B. Mottesi
950816.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	9	F.G. Thompson, G.B. Mottesi
950816.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	15	G.B. Mottesi
950816.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	33	G.B. Mottesi
950816.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	20	G.B. Mottesi
950817.1	*Helisoma anceps*	Two-ridge rams-horn	Bens Creek	SR 1509	Warren Co., NC	17 August 1995	1	G.B. Mottesi
950817.1	*Campeloma decisum*	Pointed campeloma	Bens Creek	SR 1509	Warren Co., NC	17 August 1995	28	G.B. Mottesi
950822.1	*Physella sp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	4	G.B. Mottesi
950822.1	*Pseudosuccinea columella*	Mimic lymnaea	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	1	G.B. Mottesi
950822.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	25	G.B. Mottesi
950822.1	*Lioplax subcarinata*	Ridged lioplax	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	3	G.B. Mottesi
950822.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	13	G.B. Mottesi
950822.1	*Gillia altilis*	Buffalo pebblesnail	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	1	F.G. Thompson, G.B. Mottesi
950822.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	22	G.B. Mottesi
950822.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	35	G.B. Mottesi
950823.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	16	G.B. Mottesi
950823.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	35	G.B. Mottesi
950823.1	*Laevapex fuscus*	Dusky ancylid	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	2	G.B. Mottesi
950823.1	*Physella sp.*	---	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	1	G.B. Mottesi
950823.1	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	24	F.G. Thompson, G.B. Mottesi
950823.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	24	G.B. Mottesi

Table 2. Snails found in the Little Fishing Creek Subbasin (cont.)

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
950823.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	13	G.B. Mottesi
950823.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	1	G.B. Mottesi
951023.1	*Physella sp.*	---	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	4	G.B. Mottesi
951023.1	*Campeloma decisum*	Pointed campeloma	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	2	F.G. Thompson, G.B. Mottesi
951023.1	*Helisoma anceps*	Two-ridge rams-horn	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	8	G.B. Mottesi
951023.1	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	7	F.G. Thompson, G.B. Mottesi
951023.1	*Amnicola sp.*	---	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	6	F.G. Thompson, G.B. Mottesi
951025.1	*Gillia altilis*	Buffalo pebblesnail	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	38	F.G. Thompson, G.B. Mottesi
951025.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	31	G.B. Mottesi
951025.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	19	G.B. Mottesi
951025.1	*Ferrissia rivularis*	Creeping ancylid	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	7	G.B. Mottesi
951025.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	10	G.B. Mottesi
951025.1	*Lioplax subcarinata*	Ridged lioplax	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	26	G.B. Mottesi
951025.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	4	G.B. Mottesi
951025.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	23	G.B. Mottesi
951025.1	*Physella sp.*	---	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	6	G.B. Mottesi
951025.1	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	5	F.G. Thompson, G.B. Mottesi
951026.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	25	G.B. Mottesi
951026.1	*Gillia altilis*	Buffalo pebblesnail	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	5	G.B. Mottesi
951026.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	27	G.B. Mottesi
951026.1	*Laevapex fuscus*	Ousky ancylid	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	13	G.B. Mottesi
951026.1	*Physella sp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	7	G.B. Mottesi
951026.1	*Pseudosuccinea columella*	Mimic lymnaea	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	1	G.B. Mottesi
951026.1	*Menetus dilatatus*	Bugle sprite	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	7	G.B. Mottesi
951026.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	34	G.B. Mottesi
951026.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	24	G.B. Mottesi
951026.1	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	4	F.G. Thompson, G.B. Mottesi
951026.1	*Amnicola sp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	5	F.G. Thompson, G.B. Mottesi
951027.1	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	12	G.B. Mottesi
951027.1	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	2	G.B. Mottesi
951027.1	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	3	G.B. Mottesi
951027.1	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	12	G.B. Mottesi
951027.1	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	1	G.B. Mottesi
951027.1	*Physella sp.*	---	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	1	G.B. Mottesi
951027.1	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	27 October 1995	4	F.G. Thompson, G.B. Mottesi
951027.1	*Laevapex fuscus*	Ousky ancylid	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	1	G.B. Mottesi
951027.1	*Amnicola sp.*	---	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	11	F.G. Thompson, G.B. Mottesi
960603.1	*Helisoma anceps*	Two-ridge rams-horn	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	16	G.B. Mottesi
960603.1	*Pseudosuccinea columella*	Mimic lymnaea	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.1	*Campeloma decisum*	Pointed campeloma	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	18	G.B. Mottesi
960603.1	*Laevapex fuscus*	Ousky ancylid	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	2	G.B. Mottesi
960603.2	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.2	*Menetus dilatatus*	Bugle sprite	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	G.B. Mottesi

Table 2. Snails found in the Little Fishing Creek Subbasin (cont.)

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
960603.2	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.2	*Laevapex fuscus*	Dusky ancylid	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	11	G.B. Mottesi
960603.2	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	4	G.B. Mottesi
960603.3	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	4	G.B. Mottesi
960603.3	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	7	G.B. Mottesi
960603.3	*Physella sp.*	---	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	10	G.B. Mottesi
960603.3	*Leptoxis (Mudalia) carinata*	Crested mudalia	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	5	G.B. Mottesi
960603.3	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.3	*Lioplax subcarinata*	Ridged lioplax	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	6	G.B. Mottesi
960603.3	*Campeloma decisum*	Pointed campeloma	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	14	G.B. Mottesi
960603.3	*Laevapex fuscus*	Dusky ancylid	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	8	G.B. Mottesi
960603.4	*Helisoma anceps*	Two-ridge rams-horn	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	4	G.B. Mottesi
960603.4	*Elimia catenaria*	Gravel elimia	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.4	*Elimia virginica*	Piedmont elimia	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.4	*Ferrissia rivularis*	Creeping ancylid	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	3	G.B. Mottesi
960603.5	*Amnicola (Lyogyrus) granum*	Squat duskysnail	Bear Swamp	SR 1001	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.5	*Physella sp.*	---	Bear Swamp	SR 1001	Halifax Co., NC	3 June 1996	1	G.B. Mottesi

Freshwater Mussels and Sphaeriid Clams

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Introduction

Freshwater mussels are in the Class Bivalvia. As the name implies, the mussel is separated into right and left shell-secreting centers. The shell itself is a single entity which is divided into right and left portions. Mussels are characterized by having greatly enlarged gills with ciliated filaments for filter feeding. Freshwater mussels are integral parts of many aquatic ecosystems. They provide nutrients for insects and other invertebrates and are a food source for other organisms. Because they are filter feeders, they are excellent indicators of water quality.

There are approximately 300 species and subspecies of freshwater mussels in the United States. The greatest diversity of these mussels occurs in the Southeast. Roughly 70 species can be found in North Carolina. Unfortunately, approximately half are state listed as Endangered, Threatened, or species of Special Concern (Adams 1990). It appears that the mussel fauna of the United States is in danger of extinction (reference Williams, et al. here). Therefore, it is necessary that we determine the status and distribution of these organisms so that proper management techniques can be applied.

Sphaeriid clams, like freshwater mussels, are in the Class Bivalvia and are filter feeders. The members of this family are considered the pea, pill, nut or fingernail clams. Because of their well-developed mechanism of passive dispersal and adaptability, sphaeriid clams can be found in almost any body of freshwater. Therefore, their distributions are considered truly cosmopolitan (Branson 1988). In spite of their cosmopolitan distribution, not much is known about sphaeriid clams. They are represented in North America by 38 species of the family Sphaeriidae. In North Carolina, there are approximately 13 species of sphaeriid clams (Adams 1990).

One exotic species, the Asian clam (*Corbicula fluminea* (Müller 1774)), of the family Corbiculidae (Burch 1975) was introduced into this country in 1937 and was found throughout the entire area surveyed.

Methods

Study areas for this project included certain aquatic habitats associated with Little Fishing Creek and its tributaries (Fig. 1, Introduction Section). Most habitats in Little Fishing Creek can be described as riffle/run with medium to fast flows. Pools of different sizes with low flows were also present. Substrates included combinations of silt, sand, gravel, cobble, boulder, and bedrock. Cobble is common in Little Fishing Creek. Some aquatic vegetation and organic debris were also present.

Freshwater mussels were collected at bridge crossings and during canoe runs throughout the Little Fishing Creek Subbasin. Various techniques were used including snorkeling, sifting of the substrate, visual and tactile searches, and visual searches of the shores for shells. Live mussels were identified, measured, and returned unharmed to the appropriate habitat. Fresh shells were identified, measured, and kept for curation.

Sphaeriid clams were also collected at bridge crossings and at different locations during canoe runs throughout the Little Fishing Creek Subbasin. Collecting techniques included seining, dip netting, sifting of the substrate, and visual and tactile searches. Specimens were preserved and stored in 70% ethanol. Sphaeriid clams were identified using Branson (1988) and Burch (1975). Verification of a subset of identifications was made by Dr. Gerald M. Mackie. With additional information, the identifications made of both freshwater mussels and sphaeriid clams may be subject to change.

Results and Discussion

Figure 1 shows the stations and canoe runs where freshwater mussels were found. Nine species of mussels, all within the family Unionidae, were found in the Little Fishing Creek Subbasin (Table 1).

Figure 2 shows the stations and canoe runs where sphaeriid clams were found. Two species, both within the family Sphaeriidae, were found in the Little Fishing Creek Subbasin (Table 3).

Good diversity and abundance of mussels are found throughout much of the Little Fishing Creek Subbasin. The habitat diversity and good water quality of the subbasin allows for the coexistence of freshwater mussels with varying habitat requirements. Because of the presence of reproducing populations of the Tar spinymussel, Atlantic pigtoe, and yellow lampmussel, Little Fishing Creek is nationally significant (Alderman, pers. comm., 1996).

As seen in Table 2, the *Elliptio* spp. complexes predominated the area. The specimens falling into either the *Elliptio complanata* or *Elliptio icterina* complexes were listed under the *Elliptio* spp. category. Therefore, these complexes may contain several species.

The two species of clams, *Sphaerium striatinum* (Lamarck, 1818) and *Musculium securis* (Prime, 1852), were found within the cobble substrate and silty sand. *Musculium securis* was also found in great abundance at two roadside ditches in Warren County (SR 1322 and SR 1507).

References

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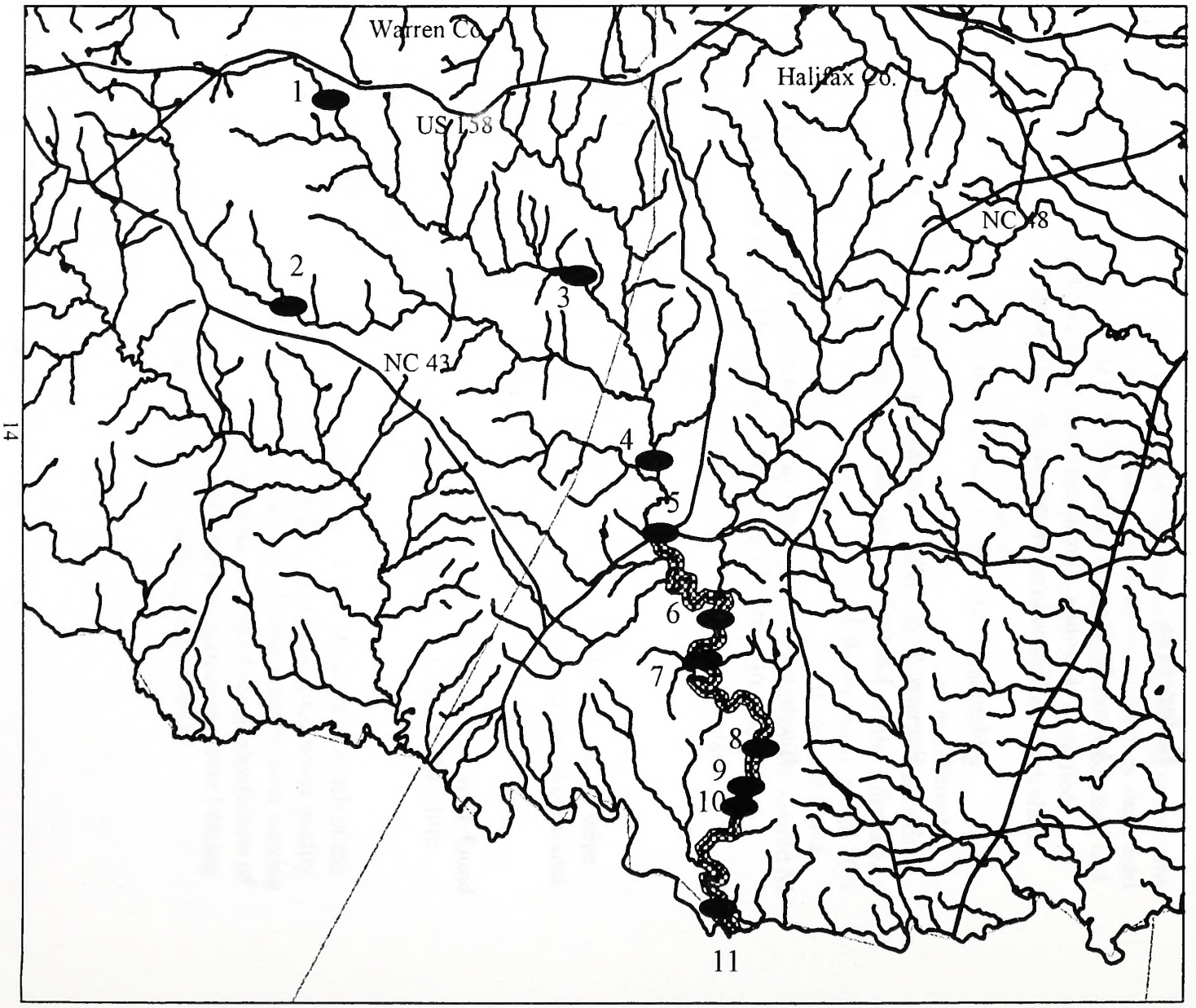
Burch, J. B. 1975. Freshwater Sphaeriacean Clams (Mollusca: Pelecypoda) of North America. Malacological Publications. Hamburg, MI. 96 pp.

LITTLE FISHING CREEK SUBBASIN

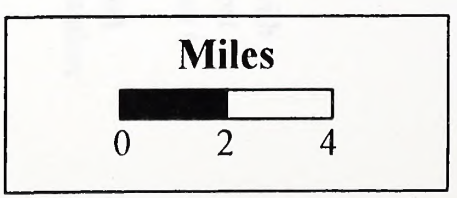
FRESHWATER MUSSEL SPECIES INVENTORY



Legend

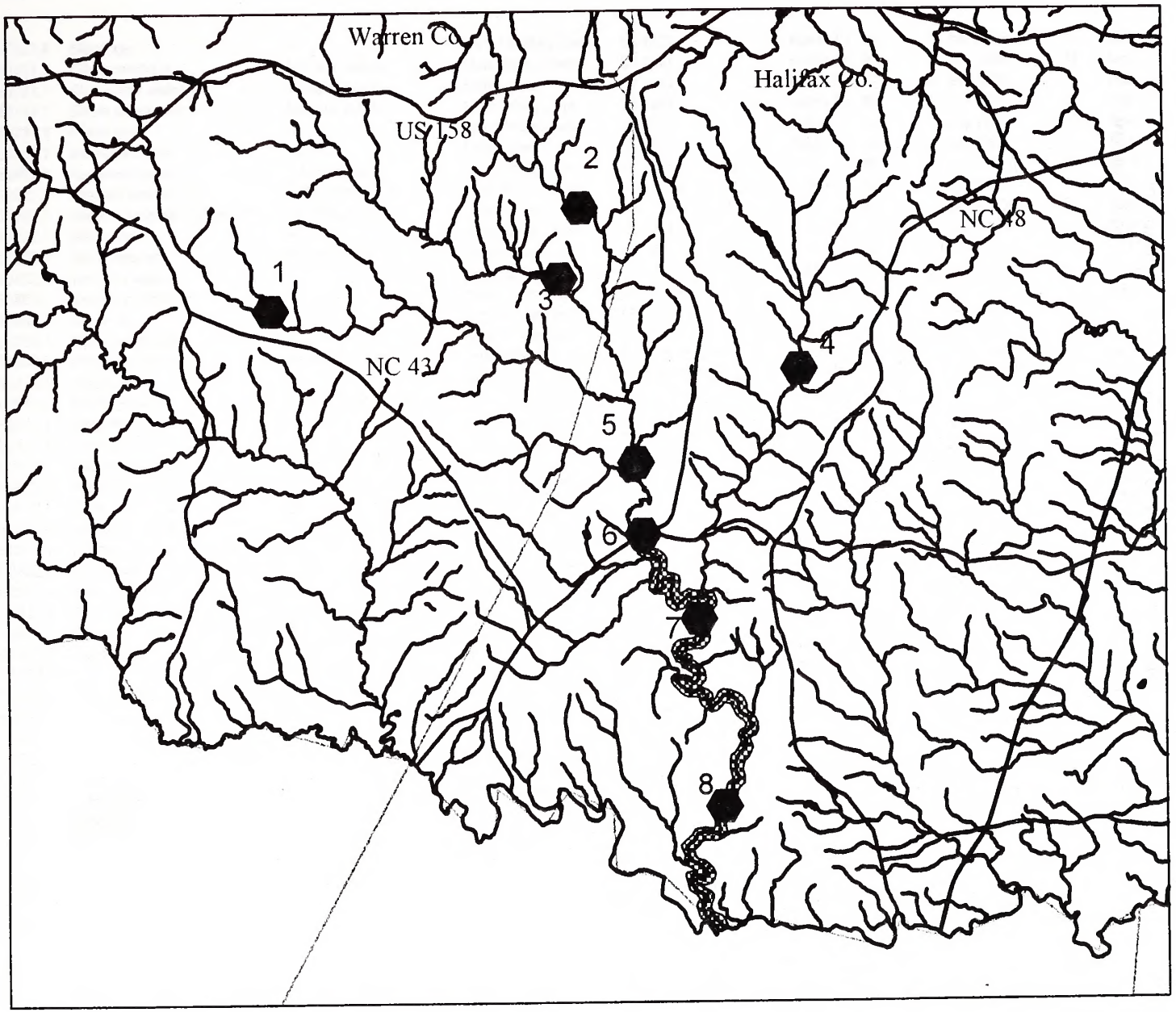
Dot No.	Station No.
1	950727.4
2	960603.1
3	960603.2
4	951026.1
5	950823.1
6	960603.4
7	950803.1
8	950802.1
9	950731.1
10	960603.3
11	951025.1

Figure 1.



LITTLE FISHING CREEK SUBBASIN

SPHAERIID CLAM SPECIES INVENTORY



Legend

Dot No.	Station No.
1	960603.1
2	950817.1
3	960603.2
4	951023.1
5	951026.1
6	950823.1
7	951027.1
8	960603.3

Figure 2.

Miles

0 2 4

Table 1. Freshwater mussels found in the Little Fishing Creek Subbasin

Unionidae	
Alasmidonta undulata (Say, 1817)	Triangle floater
Elliptio roanokensis (I. Lea, 1836)	Roanoke slabshell
Elliptio spp.	
Elliptio (Canthyria) steinstansana	Tar spinymussel
Fusconaia masoni (Conrad, 1834)	Atlantic pigtoe
Lampsilis cariosa (Say, 1817)	Yellow lampmussel
lanceolate elliptio	
Strophitus undulatus (Say, 1817)	Squawfoot
Villosa constricta (Conrad, 1838)	Notched rainbow

Table 2. Mussels found in the Little Fishing Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Type	Max L (mm)	Min L (mm)	Mean L (mm)	StDev
950727.4	*Elliptio spp.*	---	trib. to Walkers Creek	SR 1325	Warren Co., NC	27 July 1995	1	Live	71	71	71	---
950731.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	18	Live	37	19	27	5.53
950731.1	*Alasmidonta undulata*	Triangle floater	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	1	Live	30	30	30	---
950731.1	*Elliptio roanokensis*	Roanoke slabshell	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	2	Live	98	77	87.5	14.85
950731.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	179	Live	89	25	54.53	12.41
950731.1	*lanceolate elliptio*	---	Little Fishing Creek	SR 1343	Halifax Co., NC	31 July 1995	7	Live	52	34	44.57	6.5
950802.1	*Fusconaia masoni*	Atlantic pigtoe	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	14	Shell	37	20	27.21	5.19
950802.1	*Lampsilis cariosa*	Yellow lampmussel	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	Live	68	68	68	---
950802.1	*Elliptio (Canthyria) steinstansana*	Tar spinymussel	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	2	Shell	26.55	25.05	25.8	1.06
950802.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	19	Shell	88	23	38.63	15.12
950802.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	14	Shell	37	21	28.71	5.11
950802.1	*lanceolate elliptio*	---	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	3	Shell	53	30	41.67	11.5
950803.1	*lanceolate elliptio*	---	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	4	Live	---	---	---	---
950803.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	rare	Live	---	---	---	---
950803.1	*Fusconaia masoni*	Atlantic pigtoe	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	Live	---	---	---	---
950803.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	Shell	---	---	---	---
950816.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	20	Live	96	32	60.2	14.25
950816.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	2	Live	32	22	27	7.07
950816.1	*lanceolate elliptio*	---	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	1	Live	47	47	47	---
950822.1	*lanceolate elliptio*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	2	Live	49	44	463.5	3.54
950822.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	2	Live	30	23	26.5	4.95
950822.1	*Fusconaia masoni*	Atlantic pigtoe	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	2	Shell	---	---	---	---
950822.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	8	Shell	---	---	---	---
950822.1	*lanceolate elliptio*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	15	Shell	---	---	---	---
950822.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	75	Shell	---	---	---	---
950822.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	27	Live	82	35	58.85	12.02
950823.1	*Strophitus undulatus*	Squawfoot	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	---	Shell	---	---	---	---
950823.1	*Fusconaia masoni*	Atlantic pigtoe	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	---	Shell	---	---	---	---
950823.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	6	Live	37	30	34	2.97
950823.1	*Elliptio spp.*	---	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	500	Live	---	---	---	---
950823.1	*lanceolate elliptio*	---	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	18	Live	69	37	49.56	9.35
951025.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	2	Live	33	32	32.5	0.71
951025.1	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	2	Shell	44	30	37	9.9
951025.1	*Fusconaia masoni*	Atlantic pigtoe	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	1	Shell	27	27	27	---
951025.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	25 October 1995	34	Live	90	14	56.29	16.59
951025.1	*Elliptio roanokensis*	Roanoke slabshell	Little Fishing Creek	SR 1315	Halifax Co., NC	25 October 1995	1	Live	90	90	90	---
951026.1	*Elliptio spp.*	---	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	5	Shell	---	---	---	---
951026.1	*Strophitus undulatus*	Squawfoot	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	1	Live	---	---	---	---
960603.1	*Elliptio spp.*	---	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	1	Live	66	66	66	---
960603.2	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	5	Live	40	25	30.60	6.27
960603.2	*Strophitus undulatus*	Squawfoot	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	Live	58	58	58	---
960603.2	*lanceolate elliptio*	---	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	Shell	38	38	38	---
960603.2	*lanceolate elliptio*	---	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	3	Live	64	58	60.33	3.21

Table 2. Mussels found in the Little Fishing Creek Subbasin (cont.)

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Type	Max L (mm)	Min L (mm)	Mean L (mm)	StDev
960603.2	*Elliptio spp.*	---	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	45	Live	102	38	75.09	15.46
960603.3	*Villosa constricta*	Notched rainbow	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	Shell	26	26	26	---
960603.3	*Fusconaia masoni*	Atlantic pigtoe	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	7	Live	37	22	25.86	5.08
960603.3	*lanceolate elliptio*	---	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	2	Live	40	32	36	5.66
960603.3	*Elliptio spp.*	---	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	83	Live	92	27	48.96	13.05
960603.4	*lanceolate elliptio*	---	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	1	Live	58	58	58	--
960603.4	*Elliptio spp.*	---	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	18	Live	93	41	60.28	11.86

Table 3. Sphaeriid clams found in the Little Fishing Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Type	Identified By
950727.3	*Sphaerium striatinum*	Striated fingernailclam	Walkers Creek	SR 1507	Warren Co., NC	27 July 1995	1	Live	G.B. Mottesi
950817.1	*Sphaerium striatinum*	Striated fingernailclam	Bens Creek	SR 1509	Warren Co., NC	17 August 1995	18	Live	G.L. Mackie, G.B. Mottesi
950823.1	*Sphaerium striatinum*	Striated fingernailclam	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	12	Live	G.L. Mackie, G.B. Mottesi
951023.1	*Musculium securis*	Pond fingernailclam	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	10	Live	G.L. Mackie, G.B. Mottesi
951026.1	*Sphaerium striatinum*	Striated fingernailclam	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	5	Live	G.B. Mottesi
951027.1	*Sphaerium striatinum*	Striated fingernailclam	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	27 October 1995	10	Live	G.L. Mackie, G.B. Mottesi
960603.1	*Sphaerium striatinum*	Striated fingernailclam	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	11	Live	G.B. Mottesi
960603.2	*Sphaerium striatinum*	Striated fingernailclam	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	29	Live	G.B. Mottesi
960603.3	*Musculium securis*	Pond fingernailclam	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	2	Live	G.B. Mottesi

Crayfish

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Introduction

Some of the most common freshwater organisms in the Order Decapoda are crayfish. In the United States and Canada, there are currently 338 recognized taxa of crayfish. The greatest diversity of these species reside in the southeastern region of the United States (Taylor et al. 1996). In North Carolina alone, there are 29 described species and several species complexes (Cooper and Braswell 1995). In addition, there are several undescribed species that have not been officially recognized (Cooper, pers. comm., 1995). Of the 29 crayfish species found in North Carolina, one is endemic (McGrath 1994), and twelve others are listed as significantly rare by the North Carolina Natural Heritage Program (LeGrand and Hall 1995).

Being largely nocturnal aquatic species, crayfish forage mostly at night and usually seek shelter from predators during daylight hours. They are gill breathing organisms that absorb oxygen from the water. Crayfish are classified as either non-burrowers or burrowers. Non-burrowing crayfish spend their entire life in the stream bed. Burrowing crayfish excavate tunnels in roadside ditches, wet pastures, and floodplains (Taylor et al. 1996). Depending on the species, burrowing crayfish spend different amounts of their life cycle underground. Primary burrowers spend the majority of their time in burrows that extend downward to the water table (McGrath 1994). Secondary burrowers also inhabit burrows, but they venture to the surface during heavy flooding periods. Tertiary burrowers retreat to burrows only during periods of extreme drought (Hobbs 1989).

The average life span of a crayfish is between two and three years (Taylor et al. 1996). During this time, they grow through a series of molts of their exoskeleton. They have five pairs of abdominal appendages called pleopods. The first pleopod pair of the male is modified as a sexual organ. In the family Cambaridae (which includes all North Carolina species), there are two designations for adult male crayfish: Form I and Form II. Form I males are able to sexually reproduce and Form II males are not. Both forms are morphologically similar except in the texture and shape of the first pleopod. Throughout their lives, adult males cycle between Form I and Form II. Unlike adult males, adult females do not cycle between morphological forms. Once

they reach adulthood, they can sexually reproduce. During the mating season, they develop mature ova which can be seen under the posterior edge of the carapace (Boyd and Page 1978).

Crayfish play a significant role in the delicate balance of aquatic life. They consume detritus and other dead material and are subsequently consumed by larger aquatic predators such as fish, birds, and mammals. While other feeding relationships can also transfer nutrients from the detritus to the larger species, these relationships often require multiple steps. The direct food chain from detritus to crayfish to predator simplifies nutrient transfer and minimizes energy loss (Crocker and Barr 1968).

Although crayfish are common in many freshwater ecosystems, there are significant gaps in our understanding of the distribution and biology of many species. A recent report on the "Conservation Status of Crayfishes of the United States and Canada" estimated that in the United States and Canada 50% of the crayfish species are "in need of conservation recognition" (Taylor et. al. 1996).

The current project is a contribution to the ongoing collection of crayfish data. This survey focused on the crayfish which occur within North Carolina state park waterways and their surrounding tributaries. Since the emphasis of the project was on the inhabitants of the surface water, most of the crayfish collected were non-burrowers. Due to time and weather restrictions, the exact distribution of each species within the state park and its associated waterways was not determined. An estimation was made for the relative abundance of each species collected. In addition, specific habitat preferences for each species were noted.

Methods

Crayfish were surveyed along canoe runs and at bridge crossings of Little Fishing Creek and its tributaries. Species were collected with a dip net and a 6' X 10' mesh net seine. Minnow traps were set and baited with chicken liver. Collected specimens were preserved and stored in 70% ethanol.

A variety of resources were consulted for identification. "An Illustrated Checklist of the American Crayfishes" (Hobbs 1989) was particularly helpful as well as an unpublished key of North Carolina crayfish (Hobbs 1991). Dr. John Cooper, North Carolina State Museum of Natural Sciences, verified the identification of select specimens and provided additional information used for identification. With additional information, the identifications made may be subject to change.

The specific morphology and structure of the first pleopod pair of the Form I male is the key feature used to differentiate crayfish species from one another. Once a particular species is identified based on the pleopod, other characteristics can be used to recognize female and non-form I males. These characteristics include carapace, chelae, and rostrum shape and body coloration.

The carapace is the protective exoskeleton plate which encompasses the anterior half of the crayfish body. It can be deep (dorsoventrally) and narrow (laterally) or flat and wide. Some carapaces are spinose and others are smooth. The chelae are enlarged claws on the first pair of legs. They can be long and narrow or round and full; some have setae (hair) and others do not. The rostrum refers to the anterior most portion of the carapace, and it can be spinose or smooth. In terms of coloration, the exoskeleton can be plain, marbled, or striped with shades of blue, brown, tan, olive, and red.

Specimens were organized into three categories: Form I male, non-form I male, and female (Table 1). Non-form I males were not sorted into juvenile and Form II males, because it is nearly impossible to distinguish large juvenile males from small Form II males (Page, pers. comm., 1995). Additional information on the age of the collected specimens is provided by the range in carapace length (Table 1). Carapace length is measured from the tip of the rostrum to the posterior carapace edge (anterior abdomen) (Page 1985).

Results

Depending on the substrate and habitat at each site, different techniques were effective for collection. Crayfish were spotted by inspecting the substrate under large cobble. In small streams, an effective spotting method was to disturb the substrate with a few noisy steps and wait for a crayfish to emerge. A dip net was most effective for trapping crayfish under large cobble along the shorelines and in small, shallow tributaries. The seine was used for larger tributaries and the river bottom. Kicking into the seine over a riffle and walking the seine through pool areas proved effective. Walking the seine through leaf mats on the stream bottom often yielded juvenile crayfish. Minnow traps were used in deep water.

Collections were made on 15 days between 27 July 1995 and 3 June 1996 from 23 sites (Fig. 1, Introduction Section). Crayfish were collected at 14 sites (Fig. 1). Some sites were visited more than once. Four species of crayfish were collected: *Cambarus (Puncticambarus) "acuminatus"* (Faxon, 1884), *Cambarus (Depressicambarus) latimanus* (LeConte, 1856), *Orconectes* n.sp., and *Procambarus (Ortmannicus) acutus acutus* (Girard, 1852) (Table 1).

Cambarus (P.) "acuminatus" was most often found in cobble associated with riffle/run habitats. Other habitats included cobble pools along the shore and pools under roots mats. Juvenile females were also collected from a roadside ditch. Six non-form I males and 16 females were collected. Carapace length ranged from 12.1 to 37.6 mm; mean length was 20.4 mm. No Form I males were found, but non-form I males were present between 27 July and 3 June 1996 (Table 1).

Cambarus (D.) latimanus was collected from slow moving waters with sandy substrate and pools with cobble substrate. Three non-form I males and 3 females were collected. Carapace length ranged from 19.2 to 23.0 mm; mean length was 21.5 mm. No Form I males were found, but non-form I males were present between 2 August and 27 October 1995 (Table 1).

Orconectes n.sp. appeared to prefer riffle/run habitat with cobble substrate. It was also found under cobble along the shoreline of Little Fishing Creek. Twenty-one Form I males, 17 non-form I males, and 36 females were collected. Carapace length ranged from 12.1 to 33.1 mm; mean length was 19.9 mm. Form I males were collected between 15 August and 27 October 1995, and non-form I males were present between 31 July and 3 June 1996 (Table 1).

Procambarus (O.) a. acutus was found primarily in lentic waters over cobble or sandy substrate. One Form I male, 5 non-form I males were collected. No females were seen. Carapace length ranged from 9.2 to 39.9 mm; mean length was 29.2 mm. The Form I male was collected on 16 August 1995, and the non-form I males were present on 25 and 26 October 1995 (Table 1).

Discussion

There is a good diversity and abundance of crayfish species in the Little Fishing Creek Subbasin. Most stations surveyed provided habitat for at least one crayfish species, and at many sites they were considered common to abundant.

Orconectes n.sp. was the most common crayfish collected. It was abundant in Little Fishing Creek, but less common in the smaller tributaries. *Orconectes n.sp.* is well known from the Tar and Neuse drainages in North Carolina (McGrath 1993). This species is easily recognized by the spinose ornamentation of its carapace. This feature is unique among the crayfish collected in this survey from the Little Fishing Creek subbasin. A description of this species is currently awaiting publication (Cooper & Cooper, in press).

Cambarus (P.) "acuminatus" was common in the headwater tributaries, but less common in Little Fishing Creek itself. The *C. (P.) "acuminatus"* specimens collected from the Little Fishing Creek Subbasin are part of a larger species complex, *Cambarus (P.)* sp. C. This complex occurs across the Coastal Plain, Piedmont, and Mountain physiographic regions of North Carolina and needs further clarification (Cooper and Braswell 1995).

Procambarus (O.) a. acutus was present but not common in low flow habitats and backwater pools. *Cambarus (D.) latimanus* was also present although not commonly collected; no Form I males were found over the course of the survey. *C. (D.) latimanus* is known to occur in the eastern Piedmont of North Carolina (Cooper and Braswell 1995). The low abundance of specimens and lack of Form I males collected does not necessarily reflect a sparse population in the Little Fishing Creek Subbasin. Most of the survey work was done in the late summer and mid-fall when the water levels were at their lowest. Low water levels do not encourage *C. (D.) latimanus* (a secondary burrower) to venture to the surface waters.

As indicated in the introduction to this section, the present survey concentrated on species found in the waterways of Medoc Mountain State Park and its surrounding tributaries. This list of crayfish may not reflect all species in the park. Some burrowers are found in wetland habitats such as floodplains and bottomland swamps. Unfortunately, time did not allow for the survey of these additional areas.

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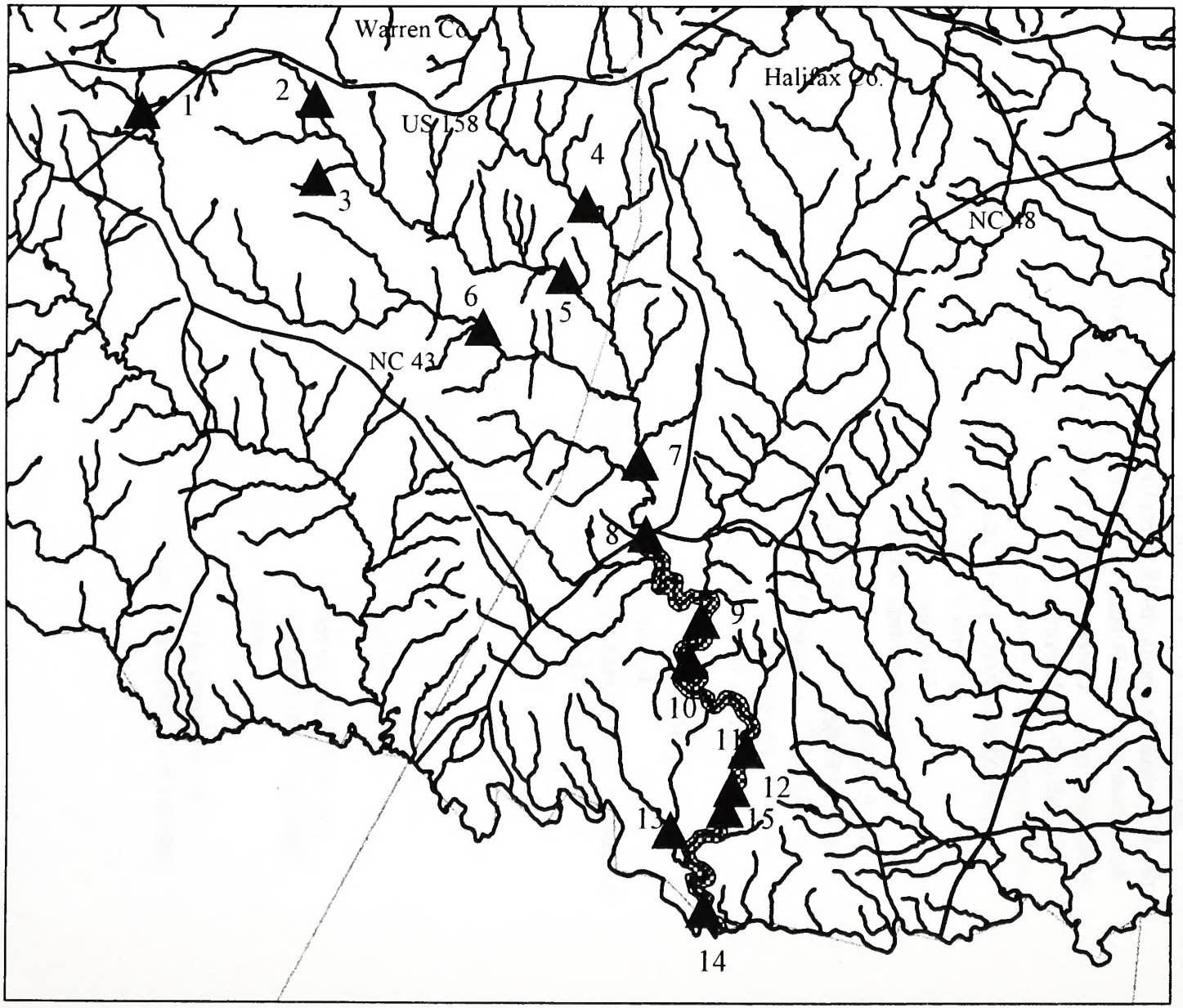
LITTLE FISHING CREEK SUBBASIN

CRAYFISH SPECIES INVENTORY



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3	950727.2
4	950817.1
5	960603.2
6	950815.5
7	951026.1
8	950815.3
9	951027.1 and 960603.4
10	950816.1
11	950802.1
12	950731.1
13	950815.1
14	951025.1
15	960603.3

Figure 1.

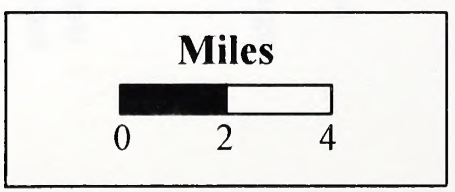

Table 1. Crayfish found in the Little Fishing Creek Subbasin

Station No.	Scientific Name	Waterway	Locality	County	Date	Form I Male (mm)	Nonform I Male (mm)	Female (mm)	Identified By
950727.1	*C. (P.) "acuminatus"*	Reedy Pond Creek	SR1325	Warren Co., NC	27 July 1995	n/a	03: Min. 19.05 : Max 30.10	04: Min. 13.60 : Max. 24.75	J.E. Cooper, M.E. Savacool
950727.2	*C. (P.) "acuminatus"*	trib. to Walkers Creek	SR1504	Warren Co., NC	27 July 1995	n/a	01: n/a	03: Min. 12.10 : Max. 22.90	M.E. Savacool
950727.4	*C. (O.) latimanus*	trib. to Walkers Creek	SR1325	Warren Co., NC	27 July 1995	n/a	n/a	01: Min. 22.10 : Max. 22.10	M.E. Savacool
950731.1	*Orconectes n.sp.*	Little Fishing Creek	SR1343	Halifax Co., NC	31 July 1995	n/a	02: Min. 12.80 : Max. 13.50	03: Min. 23.70 : Max. 28.10	M.E. Savacool
950801.1	*Orconectes n.sp.*	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	n/a	n/a	02: Min. 22.80 : Max. 26.60	M.E. Savacool
950802.1	*C. (P.) "acuminatus"*	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	n/a	n/a	03: Min. 18.00 : Max. 27.25	M.E. Savacool
950802.1	*Orconectes n.sp.*	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	n/a	n/a	01: Min. 27.50 : Max. 27.50	M.E. Savacool
950802.1	*C. (O.) latimanus*	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	n/a	01: Min. 21.60 : Max. 21.60	n/a	J.E. Cooper, M.E. Savacool
950803.1	*Orconectes n.sp.*	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	n/a	n/a	02: Min. 26.60 : Max. 30.80	M.E. Savacool
950815.1	*C. (O.) latimanus*	Powell's Creek	SR 1338	Halifax Co., NC	15 August 1995	n/a	01: Min. 23.00 : Max. 23.00	01: Min. 19.15 : Max. 19.15	J.E. Cooper, M.E. Savacool
950815.1	*C. (P.) "acuminatus"*	Powell's Creek	SR 1338	Halifax Co., NC	15 August 1995	n/a	n/a	01: Min. 17.20 : Max. 17.20	M.E. Savacool
950815.3	*Orconectes n.sp.*	Little Fishing Creek	NC 561	Halifax Co., NC	15 August 1995	01: Min. 25.15 : Max. 25.15	n/a	01: Min. 21.55 : Max. 21.55	M.E. Savacool
950815.3	*C. (P.) "acuminatus"*	Little Fishing Creek	NC 561	Halifax Co., NC	15 August 1995	n/a	n/a	01: Min. 19.00 : Max. 19.00	M.E. Savacool
950815.4	*Orconectes n.sp.*	Little Fishing Creek	SR 1315	Halifax Co., NC	15 August 1995	n/a	01: Min. 18.00 : Max. 18.00	n/a	M.E. Savacool
950815.5	*Orconectes n.sp.*	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	n/a	n/a	01: Min. 22.90 : Max. 22.90	M.E. Savacool
950816.1	*Orconectes n.sp.*	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	01: Min. 27.30 : Max. 27.30	03: Min. 16.80 : Max. 18.50	n/a	M.E. Savacool
950817.1	*P. (O.) a. acutus*	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	01: Min. 39.90 : Max. 39.90	n/a	n/a	J.E. Cooper, M.E. Savacool
950817.1	*C. (P.) "acuminatus"*	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	n/a	01: Min. 16.70 : Max. 16.70	03: Min. 10.80 : Max. 13.70	M.E. Savacool
950822.1	*Orconectes n.sp.*	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	01: Min. 33.10 : Max. 33.10	n/a	01: Min. 28.70 : Max. 28.70	M.E. Savacool
950823.1	*C. (P.) "acuminatus"*	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	n/a	01: Min. 14.30 : Max. 14.30	n/a	M.E. Savacool
950823.1	*Orconectes n.sp.*	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	01: Min. 26.25 : Max. 26.25	08: Min. 12.05 : Max. 18.75	07: Min. 13.25 : Max. 27.30	M.E. Savacool
951025.1	*Orconectes n.sp.*	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	05: Min. 15.00 : Max. 22.30	01: Min. 13.40 : Max. 13.40	01: Min. 12.30 : Max. 25.50	M.E. Savacool
951025.1	*C. (P.) "acuminatus"*	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	n/a	n/a	01: n/a	M.E. Savacool
951025.1	*P. (O.) a. acutus*	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	n/a	n/a	01: n/a	M.E. Savacool
951026.1	*Orconectes n.sp.*	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	03: Min. 17.00 : Max. 20.60	n/a	02: Min. 24.00 : Max. 29.00	M.E. Savacool
951026.1	*P. (O.) a. acutus*	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	n/a	04: Min. 9.20 : Max. 36.45	n/a	M.E. Savacool
951027.1	*C. (O.) latimanus*	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	n/a	01: n/a	01: n/a	J.E. Cooper, M.E. Savacool
951027.1	*Orconectes n.sp.*	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	07: Min. 14.40 : Max. 25.00	n/a	05: Min. 15.60 : Max. 22.40	J.E. Cooper, M.E. Savacool
960603.2	*C. (P.) "acuminatus"*	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	n/a	04: Min. 17.80 : Max. 37.55	02: observed	M.E. Savacool
960603.2	*Orconectes n.sp.*	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	n/a	02: Min. 19.50 : Max. 23.90	03: Min. 10.50 : Max. 24.80	M.E. Savacool
960603.3	*Orconectes n.sp.*	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	n/a	n/a	01: observed	M.E. Savacool
960603.4	*C. (P.) "acuminatus"*	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	3 June 1996	n/a	n/a	01: observed	M.E. Savacool
960603.4	*Orconectes n.sp.*	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	3 June 1996	n/a	n/a	02: observed	M.E. Savacool

Freshwater Fishes

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NC Wildlife Resources Commission

Introduction

Approximately 790 fish species are believed to occur in the freshwaters of the United States and Canada (Page & Burr 1991). More than 225 species can be found in North Carolina (Menhinick 1991). This unusually rich and variable fish fauna is due to a great diversity of habitats found within the state and to different zoogeographic distribution patterns of various species. Many game species, several bait and forage species, and at least one aquarium species have become established in North Carolina waters (Menhinick 1991).

Unfortunately, almost one quarter of the fish occurring in North Carolina are state listed as Endangered, Threatened, or Special Concern species. This is of concern since fish are important components of aquatic ecosystems; they are indicators of water quality; and many species are a source of recreation for the state's citizens. Therefore, it is important that we determine their status/distributions and apply proper conservation techniques where necessary.

Methods

Study areas for this project included certain aquatic habitats associated with Little Fishing Creek and its tributaries (Fig. 1, Introduction Section). Most habitats in Little Fishing Creek can be described as riffle/run with medium to fast flows. Pools of different sizes with low flows were also present. Substrates included combinations of silt, sand, gravel, cobble, boulder, and bedrock. Cobble is common in Little Fishing Creek. Some aquatic vegetation and organic debris were also present.

Fish were collected during canoe runs of Little Fishing Creek and at bridge crossings of Little Fishing Creek and its tributaries. Collecting techniques included the use of a 6' x 10' minnow seine, dip nets, and minnow traps. Different techniques of seining, such as kicking, setting, and dragging, were necessary due to the diversity of habitats. Specimens were fixed in 10% formalin and preserved in 70% alcohol. Specimens not collected were returned unharmed.

The following sources were used as identification tools: Jenkins (1995), Menhinick (1991), Page (1983), and Page and Burr (1991). Some identifications were verified using specimens from the collection of the N.C. State Museum of Natural Sciences. With additional information, identifications may be subject to change.

Results and Discussion

Figure 1 shows stations and canoe runs where fish were found. Twenty-eight species of fish representing nine families were found within the Little Fishing Creek Subbasin (Table 1).

The darters collected were found in the riffle/run areas with medium flow. The johnny darter (*Etheostoma nigrum*) was also collected from small pools. The riffle/run and small pool areas also provided niches for the cyprinids and catostomids. The pirate perch (*Aphredoderus sayanus*) was found near root mats and underneath leaves and other organic debris.

The American eel (*Anguilla rostrata*) was collected in a minnow trap set in an undercut bank. Juvenile centrarchids were also found in the small pools near the undercut banks.

The deeper pools of Little Fishing Creek were inhabited by the larger centrarchid species, including the Roanoke bass (*Ambloplites cavifrons*), which is designated Significantly Rare by the North Carolina Natural Heritage Program. Within the deeper pools and in the faster current runs, the northern hogsucker (*Hypentelium nigricans*), the silver redhorse (*Moxostoma anisurum*), the black jumprock (*Scartomyzon cervinus*), and the chain pickerel (*Esox niger*) were also found.

The Carolina madtom (*Noturus furiosus*) and the margined madtom (*Noturus insignis*) were collected in areas just beneath the faster riffle/runs where some aquatic vegetation and debris were observed. The habitat within some areas of Little Fishing Creek seems suitable for a good abundance of the Carolina madtom, State listed Special Concern, but this species was only found at three of the stations surveyed (Table 2).

The Little Fishing Creek Subbasin contains a good diversity and abundance of fish species. As shown in Table 2, most species were documented in fair numbers at each site. The habitat diversity and good water quality of this subbasin allows for the coexistence of species with very diverse habitat requirements.

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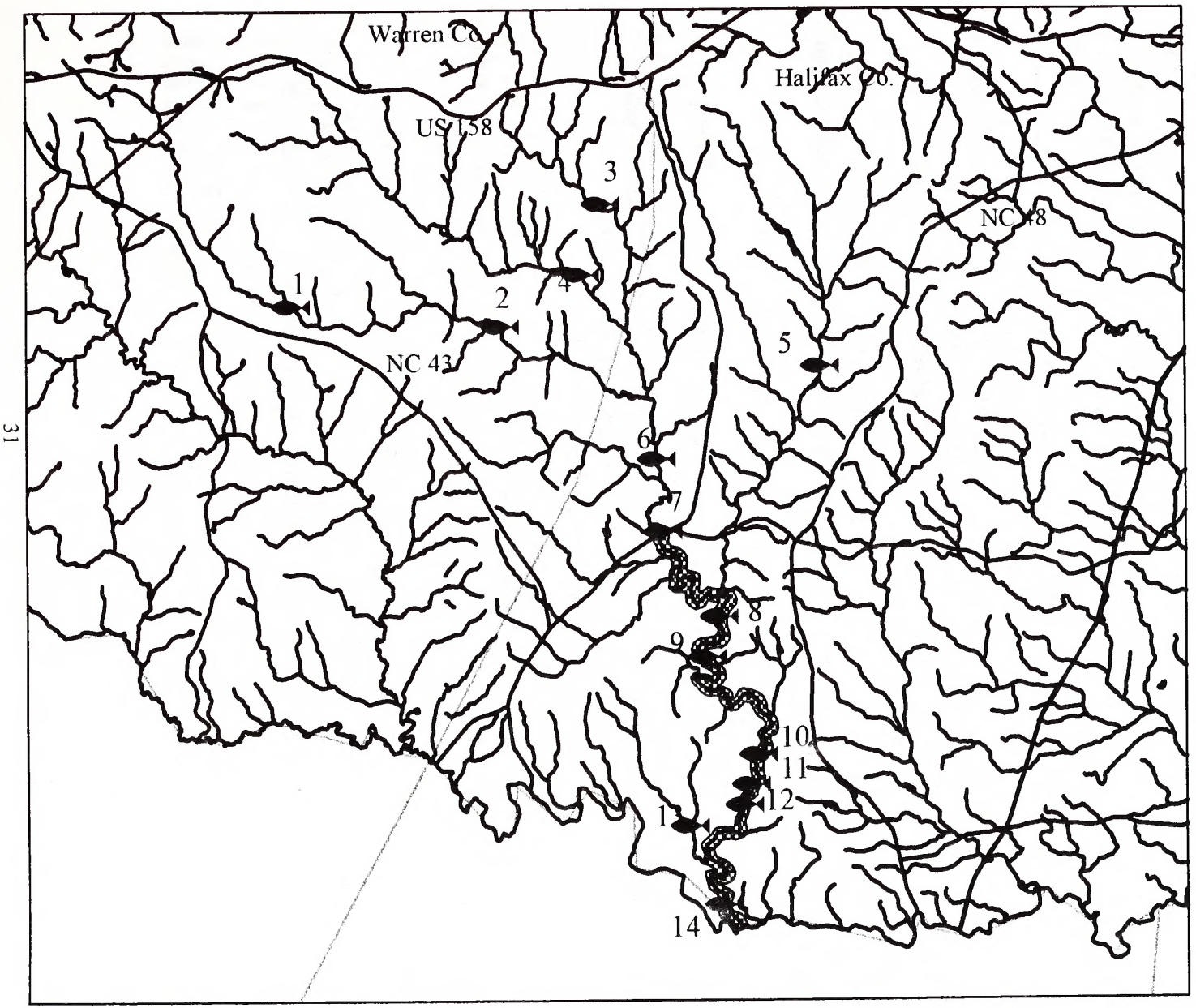
LITTLE FISHING CREEK SUBBASIN

FISH SPECIES INVENTORY



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9	950816.1
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11	950801.1
12	960603.3
13	950815.1
14	951025.1

Figure 1.

Miles

0 2 4

Table 1. Fish found in the Little Fishing Creek Subbasin

Anguillidae	
Anguilla rostrata (Lesueur, 1817)	American eel
Esocidae	
Esox niger Lesueur, 1818	Chain pickerel
Cyprinidae	
Cyprinella analostana Girard, 1859	Satinfin shiner
Luxilus albeolus (Jordan, 1889)	White shiner
Luxilus cerasinus (Cope, 1868)	Crescent shiner
Lythrurus ardens (Cope, 1868)	Rosefin shiner
Nocomis leptocephalus (Girard, 1856)	Bluehead chub
Notropis altipinnis (Cope, 1870)	Highfin shiner
Notropis procne (Cope, 1865)	Swallowtail shiner
Semotilus atromaculatus (Mitchill, 1818)	Creek chub
Catostomidae	
Hypentelium nigricans (Lesueur, 1817)	Northern hogsucker
Moxostoma anisurum (Rafinesque, 1820)	Silver redhorse
Scartomyzon cervinus (Cope, 1868)	Black jumprock
Ictaluridae	
Noturus furiosus Jordan & Meek, 1889	Carolina madtom
Noturus insignis (Richardson, 1836)	Margined madtom
Aphredoderidae	
Aphredoderus sayanus (Gilliams, 1824)	Pirate perch
Poeciliidae	
Gambusia affinis (Baird &Girard, 1853)	Mosquitofish
Centrarchidae	
Ambloplites cavifrons Cope, 1868	Roanoke bass
Centrarchus macropterus Lacepède, 1802)	Flier
Enneacanthus gloriosus (Holbrook, 1855)	Bluespotted sunfish
Lepomis auritus (Linnaeus, 1758)	Redbreast sunfish
Lepomis cyanellus Rafinesque, 1819	Green sunfish
Lepomis gibbosus (Linnaeus, 1758)	Pumpkinseed sunfish
Lepomis gulosus (Cuvier, 1829)	Warmouth
Percidae	
Etheostoma nigrum Rafinesque, 1820	Johnny darter
Etheostoma vitreum (Cope, 1870)	Glassy darter
Percina peltata (Stauffer, 1864)	Shield darter
Percina roanoka (Jordan & Jenkins, 1889)	Roanoke darter

Table 2. Fish found in the Little Fishing Creek Subbasin

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
950801.1	*Noturus insignis*	Margined madtom	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	1	G.B. Mottesi
950801.1	*Anguilla rostrata*	American eel	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	1	G.B. Mottesi
950801.1	*Aphredoderus sayanus*	Pirate perch	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	1	G.B. Mottesi
950801.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	2	G.B. Mottesi
950801.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	1	G.B. Mottesi
950801.1	*Percina peltata*	Shield darter	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	2	G.B. Mottesi
950801.1	*Lepomis auritus*	Redbreast sunfish	Little Fishing Creek	Lynch Farm	Halifax Co., NC	1 August 1995	4	G.B. Mottesi
950802.2	*Noturus furiosus*	Carolina madtom	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	G.B. Mottesi
950802.2	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	3	G.B. Mottesi
950802.2	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	5	G.B. Mottesi
950802.2	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	2	G.B. Mottesi
950802.2	*Percina roanoka*	Roanoke darter	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	3	G.B. Mottesi
950802.2	*Gambusia affinis*	Mosquitofish	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	2	G.B. Mottesi
950802.2	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	G.B. Mottesi
950802.2	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	G.B. Mottesi
950802.2	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	7	G.B. Mottesi
950802.2	*Esox niger*	Chain pickerel	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	G.B. Mottesi
950802.2	*Lepomis auritus*	Redbreast sunfish	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	2	G.B. Mottesi
950802.3	*Noturus furiosus*	Carolina madtom	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	G.B. Mottesi
950802.3	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	2	G.B. Mottesi
950802.3	*Lepomis cyanellus*	Green sunfish	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	1	G.B. Mottesi
950802.3	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1214 to SR 1343	Halifax Co., NC	2 August 1995	2	G.B. Mottesi
950803.1	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950803.1	*Luxilus albeolus*	White shiner	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950803.1	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950803.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	7	G.B. Mottesi
950803.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950803.1	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950803.1	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	2	G.B. Mottesi
950803.1	*Percina roanoka*	Roanoke darter	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	2	G.B. Mottesi
950803.1	*Ambloplites cavifrons*	Roanoke bass	Little Fishing Creek	SR 1002 to SR 1214	Halifax Co., NC	3 August 1995	1	G.B. Mottesi
950815.1	*Aphredoderus sayanus*	Pirate perch	Powell's Creek	SR 1338	Halifax Co., NC	15 August 1995	2	G.B. Mottesi
950815.1	*Esox niger*	Chain pickerel	Powell's Creek	SR 1338	Halifax Co., NC	15 August 1995	1	G.B. Mottesi
950815.1	*Lepomis gibbosus*	Pumpkinseed sunfish	Powell's Creek	SR 1338	Halifax Co., NC	15 August 1995	2	G.B. Mottesi
950815.5	*Noturus insignis*	Margined madtom	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950815.5	*Luxilus albeolus*	White shiner	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950815.5	*Notropis procne*	Swallowtail shiner	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	4	G.B. Mottesi
950815.5	*Lythrurus ardens*	Rosefin shiner	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950815.5	*Nocomis leptocephalus*	Bluehead chub	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	2	G.B. Mottesi
950815.5	*Aphredoderus sayanus*	Pirate perch	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950815.5	*Etheostoma nigrum*	Johnny darter	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	5	G.B. Mottesi
950815.5	*Percina peltata*	Shield darter	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950815.5	*Percina roanoka*	Roanoke darter	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	2	G.B. Mottesi

Table 2. Fish found in the Little Fishing Creek Subbasin (cont.)

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
950815.5	*Lepomis auritus*	Redbreast sunfish	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950815.5	*Lepomis gulosus*	Warmouth	Reedy Pond Creek	SR 1512	Warren Co., NC	15 August 1995	1	G.B. Mottesi
950816.1	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	4	G.B. Mottesi
950816.1	*Percina roanoka*	Roanoke darter	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	6	G.B. Mottesi
950816.1	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	1	G.B. Mottesi
950816.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	3	G.B. Mottesi
950816.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	4	G.B. Mottesi
950816.1	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	4	G.B. Mottesi
950816.1	*Lepomis auritus*	Redbreast sunfish	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	1	G.B. Mottesi
950816.1	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	SR 1322 to SR 1002	Halifax Co., NC	16 August 1995	4	G.B. Mottesi
950817.1	*Etheostoma nigrum*	Johnny darter	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	8	G.B. Mottesi
950817.1	*Percina roanoka*	Roanoke darter	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	2	G.B. Mottesi
950817.1	*Aphredoderus sayanus*	Pirate perch	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	1	G.B. Mottesi
950817.1	*Notropis procne*	Swallowtail shiner	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	1	G.B. Mottesi
950817.1	*Nocomis leptocephalus*	Bluehead chub	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	5	G.B. Mottesi
950817.1	*Lepomis auritus*	Redbreast sunfish	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	1	G.B. Mottesi
950817.1	*Luxilus albeolus*	White shiner	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	4	G.B. Mottesi
950817.1	*Luxilus cerasinus*	Crescent shiner	Bens Creek	SR 1509	Warren Co., NC	16 August 1995	6	G.B. Mottesi
950822.1	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	3	G.B. Mottesi
950822.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	5	G.B. Mottesi
950822.1	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	5	G.B. Mottesi
950822.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1315	Halifax Co., NC	22 August 1995	3	G.B. Mottesi
950823.1	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	7	G.B. Mottesi
950823.1	*Aphredoderus sayanus*	Pirate perch	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	4	G.B. Mottesi
950823.1	*Luxilus albeolus*	White shiner	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	8	G.B. Mottesi
950823.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	7	G.B. Mottesi
950823.1	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	7	G.B. Mottesi
950823.1	*Noturus insignis*	Margined madtom	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	5	G.B. Mottesi
950823.1	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	5	G.B. Mottesi
950823.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	7	G.B. Mottesi
950823.1	*Percina roanoka*	Roanoke darter	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	21	G.B. Mottesi
950823.1	*Lepomis auritus*	Redbreast sunfish	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	2	G.B. Mottesi
950823.1	*Moxostoma anisurum*	Silver redhorse	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	1	G.B. Mottesi
950823.1	*Ambloplites cavifrons*	Roanoke bass	Little Fishing Creek	NC 561 to SR 1322	Halifax Co., NC	23 August 1995	Obs.	G.B. Mottesi
951023.1	*Gambusia affinis*	Mosquitofish	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	4	G.B. Mottesi
951023.1	*Aphredoderus sayanus*	Pirate perch	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	1	G.B. Mottesi
951023.1	*Enneacanthus gloriosus*	Bluespotted sunfish	Bear Swamp	SR 1310	Halifax Co., NC	23 October 1995	4	G.B. Mottesi
951025.1	*Esox niger*	Chain pickerel	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	1	G.B. Mottesi
951025.1	*Aphredoderus sayanus*	Pirate perch	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	2	G.B. Mottesi
951025.1	*Anguilla rostrata*	American eel	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	1	G.B. Mottesi
951025.1	*Lepomis auritus*	Redbreast sunfish	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	1	G.B. Mottesi
951025.1	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	8	G.B. Mottesi
951025.1	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	6	G.B. Mottesi

Table 2. Fish found in the Little Fishing Creek Subbasin (cont.)

Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
951025.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	16	G.B. Mottesi
951025.1	*Luxilus albeolus*	White shiner	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	10	G.B. Mottesi
951025.1	*Hypentelium nigricans*	Northern hogsucker	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	1	G.B. Mottesi
951025.1	*Cyprinella analostana*	Satinfin shiner	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	4	G.B. Mottesi
951025.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	8	G.B. Mottesi
951025.1	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	6	G.B. Mottesi
951025.1	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	6	G.B. Mottesi
951025.1	*Percina roanoka*	Roanoke darter	Little Fishing Creek	SR 1343	Halifax Co., NC	25 October 1995	14	G.B. Mottesi
951026.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	6	G.B. Mottesi
951026.1	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	1	G.B. Mottesi
951026.1	*Gambusia affinis*	Mosquitofish	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	1	G.B. Mottesi
951026.1	*Aphredoderus sayanus*	Pirate perch	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	4	G.B. Mottesi
951026.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	1	G.B. Mottesi
951026.1	*Noturus insignis*	Margined madtom	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	1	G.B. Mottesi
951026.1	*Enneacanthus gloriosus*	Bluespotted sunfish	Little Fishing Creek	SR 1315	Halifax Co., NC	26 October 1995	5	G.B. Mottesi
951027.1	*Gambusia affinis*	Mosquitofish	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	2	G.B. Mottesi
951027.1	*Anguilla rostrata*	American eel	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	27 October 1995	1	G.B. Mottesi
951027.1	*Lepomis auritus*	Redbreast sunfish	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	2	G.B. Mottesi
951027.1	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	3	G.B. Mottesi
951027.1	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	12	G.B. Mottesi
951027.1	*Percina peltata*	Shield darter	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	1	G.B. Mottesi
951027.1	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	1	G.B. Mottesi
951027.1	*Semotilus atromaculatus*	Creek chub	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	8	G.B. Mottesi
951027.1	*Percina roanoka*	Roanoka darter	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	12	G.B. Mottesi
951027.1	*Scartomyzon cervinus*	Black jumprock	Little Fishing Creek	Oiscovery Trail (State Park)	Halifax Co., NC	27 October 1995	2	G.B. Mottesi
960603.1	*Aphredoderus sayanus*	Pirate perch	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	2	G.B. Mottesi
960603.1	*Enneacanthus gloriosus*	Bluespotted sunfish	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.1	*Lythrurus ardens*	Rosefin shiner	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	3	G.B. Mottesi
960603.1	*Luxilus cerasinus*	Crescent shiner	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	4	G.B. Mottesi
960603.1	*Notropis altipinnis*	Highfin shiner	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	10	G.B. Mottesi
960603.1	*Etheostoma nigrum*	Johnny darter	Reedy Creek	SR 1507	Warren Co., NC	3 June 1996	19	G.B. Mottesi
960603.2	*Percina roanoka*	Roanoke darter	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	4	G.B. Mottesi
960603.2	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.2	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.2	*Notropis altipinnis*	Highfin shiner	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	2	G.B. Mottesi
960603.2	*Gambusia affinis*	Mosquitofish	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	5	G.B. Mottesi
960603.2	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	4	G.B. Mottesi
960603.2	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	4	G.B. Mottesi
960603.2	*Centrarchus macropterus*	Flier	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	1	G.B. Mottesi
960603.2	*Luxilus cerasinus*	Crescent shiner	Little Fishing Creek	SR 1509	Warren Co., NC	3 June 1996	3	G.B. Mottesi
960603.3	*Percina roanoka*	Roanoke darter	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	3	G.B. Mottesi
960603.3	*Percina peltata*	Shield darter	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	3	G.B. Mottesi
960603.3	*Etheostoma vitreum*	Glassy darter	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	3	G.B. Mottesi

Table 2. Fish found in the Little Fishing Creek Subbasin (cont.)

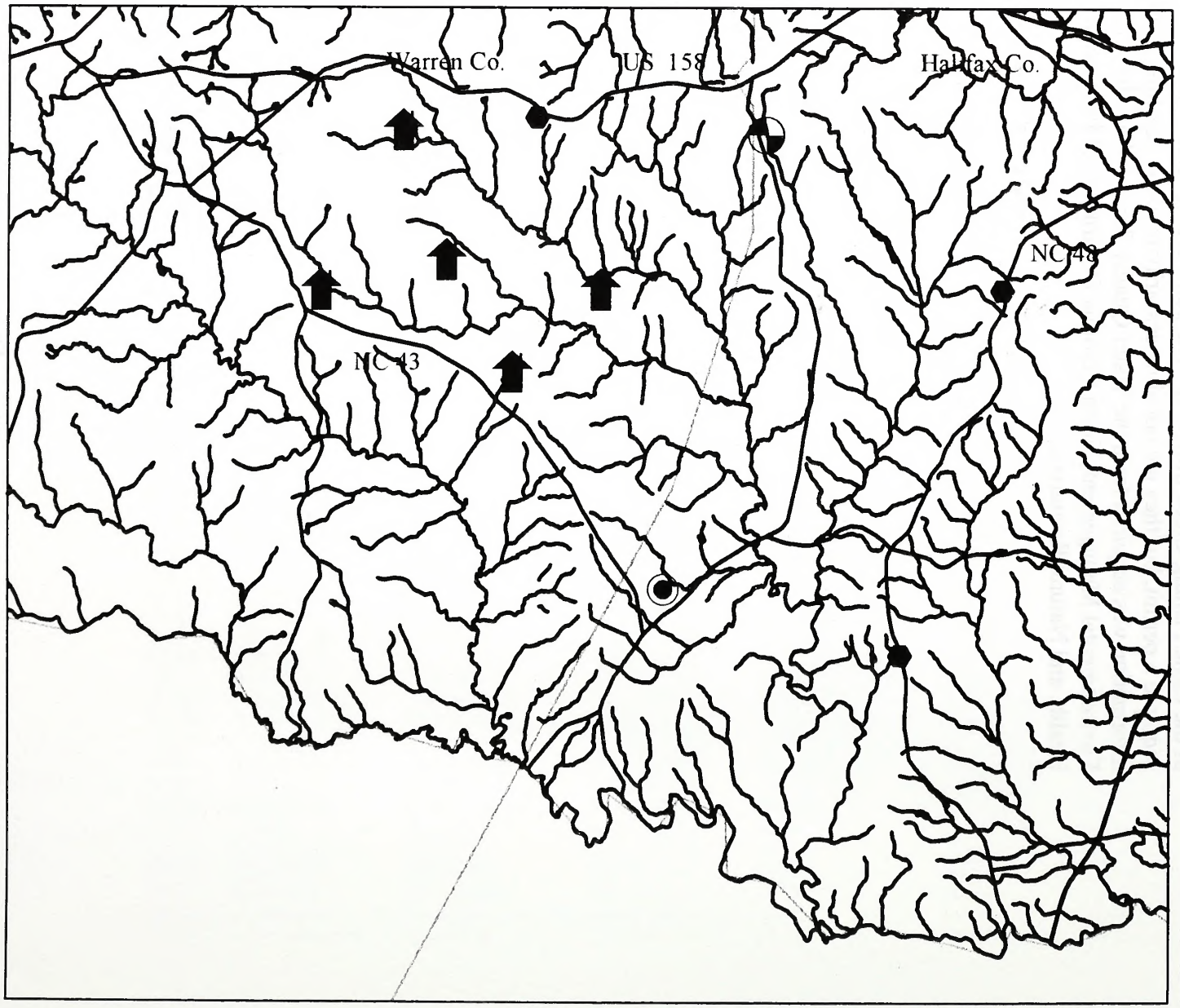
Station No.	Scientific Name	Common Name	Waterway	Locality	County	Date	Number	Identified By
960603.3	*Etheostoma nigrum*	Johnny darter	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.3	*Nocomis leptocephalus*	Bluehead chub	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	2	G.B. Mottesi
960603.3	*Lythrurus ardens*	Rosefin shiner	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	3	G.B. Mottesi
960603.3	*Notropis procne*	Swallowtail shiner	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	2	G.B. Mottesi
960603.3	*Noturus furiosus*	Carolina madtom	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.3	*Luxilus cerasinus*	Crescent shiner	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.3	*Lepomis gibbosus*	Pumpkinseed sunfish	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.3	*Lepomis cyanellus*	Green sunfish	Little Fishing Creek	SR 1338	Halifax Co., NC	3 June 1996	1	G.B. Mottesi
960603.4	*Notropis altipinnis*	Highfin shiner	Little Fishing Creek	Discovery Trail (State Park)	Halifax Co., NC	3 June 1996	abun	G.B. Mottesi

Point Sources and Animal Facilities

Gabriela B. Mottesi, Nongame Biologist
Nongame and Endangered Wildlife Program
Division of Wildlife Management
NC Wildlife Resources Commission

The following map shows the animal facilities and point sources of pollution in the Little Fishing Creek Subbasin. The point sources shown are those that acquired a permit, but they are not all necessarily in use at this time. This information was acquired from the Water Quality Section, Division of Environmental Management, North Carolina Department of Environment, Health, and Natural Resources.

LITTLE FISHING CREEK SUBBASIN
PERMITTED POINT SOURCES OF POLLUTION AND ANIMAL FACILITIES



BET. 0.051& 1.0 MGD

BET. 0.011& 0.050 MGD

<= 0.010 MGD

ANIMAL FAC.

Figure 1.

Miles

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